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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED  
STATION ON THE KOOTENAI RIVER,  
LINCOLN COUNTY, MONTANA**

August 9, 2001

**A report to  
the Montana Department of Environmental Quality  
Helena, Montana**

**by  
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## INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Kootenai River near Libby Dam, Montana on August 9, 2001. The sample site was located by GPS reading at 48° 22' 39" N, 115° 19' 03" W, lying within the Northern Rockies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

## RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored sub-optimally. Although field notes described a "nice riffle", riffle development was assigned a marginal score in the evaluation. Benthic substrate apparently lacked some diversity, since it was judged sub-optimal. Some sediment deposition was reported, although only minimal embeddedness was noted. Streambanks were perceived to be stable, but bank vegetation was marginal on the left bank and "lots of knapweed" observed. The riparian zone was mildly abbreviated.

**Table 1.** Stream and riparian habitat assessment for a fixed station on the Kootenai River. August 2001.

Max. possible score	Parameter	Kootenai River near Libby Dam
10	Riffle development	5
10	Benthic substrate	7
20	Embeddedness	18
20	Channel alteration	13
20	Sediment deposition	15
20	Channel flow status	19
20	Bank stability: left / right	9 / 9
20	Bank vegetation: left / right	5 / 7
20	Vegetated zone: left / right	6 / 9
160	Total	122
	Percent of maximum CONDITION*	76 <b>SUB-OPTIMAL</b>

\*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%, Marginal 49 - 29%, Poor <23%  
Adapted from Plafkin et al. 1998.

**Table 2.** Metric values, scores, and bioassessment for a fixed station on the Kootenai River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Kootenai River near Libby Dam	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	4	2
Plecoptera richness	0	0
Trichoptera richness	4	2
Number of sensitive taxa	0	0
Percent filterers	5.6	2
Percent tolerant taxa	6.6	2
	<b>TOTAL SCORE (max.=18)</b>	<b>8</b>
	<b>PERCENT OF MAX.</b>	<b>44</b>
	<b>Impairment classification</b>	<b>MODERATE</b>
	<b>USE SUPPORT</b>	<b>PARTIAL</b>

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Kootenai River is moderately impaired and only partially supports designated uses.

The biotic index value (5.76) was higher than the mean value (4.41) for other riverine sites in Western Montana where fixed stations were studied. The mayfly taxa richness (4) was also somewhat lower than expected. These findings suggest that water quality may have been impaired by nutrients. Thirty-four percent of animals taken in the sample from the Kootenai River site were non-insects, with *Hydra* sp. alone comprising

12% of the fauna. The dominance of non-insect taxa suggests that water temperatures may remain static throughout the year; the lack of stoneflies in the assemblage may also be related to the absence of seasonal thermal cues. Since *Hydra* sp. is especially abundant in outflow situations, the taxonomic composition of the sample conforms to what would be expected below an impoundment dam. Hypolimnetic discharges from reservoirs tend to be nutrient-rich; this may account for the elevated biotic index value.

Eleven “clinger” taxa were collected, suggesting that hard substrate habitats were not substantially impaired by fine sediment deposition. The functional composition of the sampled assemblage was skewed toward gatherers, with scrapers and shredders under-represented; the low abundance of shredders is probably within expectations for below-dam conditions.

## CONCLUSION

- The benthic invertebrate community at this site on the Kootenai River appears to be determined by the site’s location: downstream of a hypolimnetic discharge from Lake Koocanusa via the Libby Dam. A static thermal regime and nutrient-enriched water has resulted in a nutrient-tolerant fauna dominated by non-insect taxa.
- Compared to free-flowing riverine environments, the impairment classification assigned by the bioassessment method used seems appropriate, given the taxonomic composition of the benthic assemblage.

## LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master’s (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP’s. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana (Color poster with map, descriptive text, summary tables, and photographs); Reston, Virginia. US Geological Survey.

## **APPENDIX**

### **Taxonomic data and summaries**

#### **Kootenai River**

**July 2001**

# Aquatic Invertebrate Taxonomic Data

Site Name: Kootenai River near Libby Dam

Date: 8/07/01

Site ID: K01KOOTR01

Approx. percent of sample used: 27

Taxon	Quantity	Percent	HBI	FFG
<i>Hydra</i> sp.	36	11.88	5	PR
<i>Dugesia</i> sp.	24	7.92	4	PR
Nematoda	28	9.24	11	PA
<i>Nais bretscheri</i>	3	0.99	8	CG
<i>Nais variabilis</i>	5	1.65	10	CG
Imma. Tubificid with cap. setae	1	0.33	10	CG
<i>Rhynchelmis</i> sp.	1	0.33	4	CG
<i>Eiseniella tetraedra</i>	1	0.33	8	CG
<i>Fossaria</i> sp.	6	1.98	6	SC
<b>Total Misc. Taxa</b>	<b>105</b>	<b>34.65</b>		
<i>Acentrella turbida</i>	3	0.99	4	CG
<i>Baetis tricaudatus</i>	4	1.32	4	CG
<i>Ephemerella inermis infrequens</i>	33	10.89	4	CG
<i>Serratella tibialis</i>	3	0.99	2	CG
<b>Total Ephemeroptera</b>	<b>43</b>	<b>14.19</b>		
<i>Brachycentrus americanus</i>	1	0.33	1	CF
<i>Hydropsyche</i> sp.	2	0.66	5	CF
<i>Hydroptila</i> sp.	1	0.33	6	PH
<i>Lepidostoma</i> sp.-saud case larvae	6	1.98	1	SH
<b>Total Trichoptera</b>	<b>10</b>	<b>3.30</b>		
<i>Optioservus</i> sp.	2	0.66	5	SC
<i>Zaitzevia</i> sp.	1	0.33	5	CG
<b>Total Coleoptera</b>	<b>3</b>	<b>0.99</b>		
<i>Clinocera</i> sp.	5	1.65	5	PR
<i>Simulium</i> sp.	14	4.62	5	CF
<b>Total Diptera</b>	<b>19</b>	<b>6.27</b>		
<i>Cricotopus</i> (Isocladius) Gr.	53	17.49	7	CG
<i>Dicrotendipes</i> sp.	4	1.32	8	CG
<i>Eukiefferiella Devonica</i> Gr.	5	1.65	8	CG
<i>Eukiefferiella Pseudomontana</i> Gr.	2	0.66	8	CG
<i>Micropsectra</i> sp.	27	8.91	4	CG
<i>Parametriocnemus</i> sp.	9	2.97	5	CG
<i>Polypedilum</i> sp.	2	0.66	6	SH
<i>Tvetenia</i> sp.	21	6.93	5	CG
<b>Total Chironomidae</b>	<b>123</b>	<b>40.59</b>		
<b>Grand Total</b>	<b>303</b>	<b>100.00</b>		

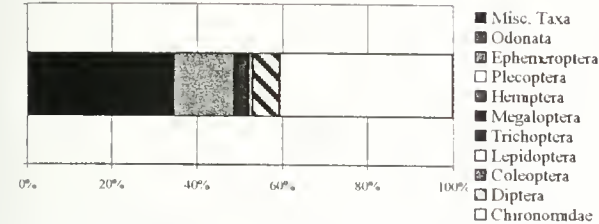


Aquatic Invertebrate Summary

Site Name: Kootenai River near Libby Dam		Date: 8/07/01
SAMPLE TOTAL	303	
EPT abundance	53	
TAXA RICHNESS	29	
Number EPT taxa	8	
Percent EPT	17.49	

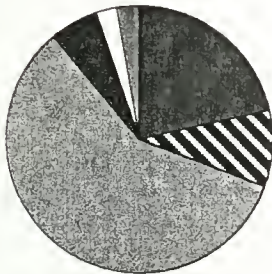
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	34.65	9	105
Odonata	0.00	0	0
Ephemeroptera	14.19	4	43
Plecoptera	0.00	0	0
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	3.30	4	10
Lepidoptera	0.00	0	0
Coleoptera	0.99	2	3
Diptera	6.27	2	19
Chironomidae	40.59	8	123



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	21.45	3	65
Parasite	9.24	1	28
Gatherer	58.09	17	176
Filterer	5.61	3	17
Herbivore	0.00	0	0
Piercer	0.33	1	1
Scraper	2.64	2	8
Shredder	2.64	2	8
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.00	0	0



- Predator
- Parasite
- Gatherer
- Filterer
- Herbivore
- Piercer
- Scraper
- Shredder
- Xylophage
- Omnivore
- Unknown

COMMUNITY TOLERANCES

Sediment tolerant taxa	3
Percent sediment tolerant	2.64
Sediment sensitive taxa	0
Percent sediment sensitive	0.00
Metals tolerance index (McGuire)	3.72
Cold stenotherm taxa	0
Percent cold stenotherms	0.00

Site ID: K01KOOTR01

DOMINANCE		
TAXON	ABUNDANCE	PERCENT
Cricotopus (Isocladus) Gr	53	17.49
Hydra sp	36	11.88
Ephemerella inermis infrequens	33	10.89
Nematoda	28	9.24
Micropsectra sp	27	8.91
SUBTOTAL 5 DOMINANTS	177	58.42
Dugesia sp	24	7.92
Ivetenia sp	21	6.93
Simulium sp	14	4.62
Parametrioctenemus sp	9	2.97
Fossaria sp	6	1.98
TOTAL DOMINANTS	251	82.84

SAPROBITY

Hilsenhoff Biotic Index	5.76
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DIVERSITY

Shannon H (loge)	2.72
Shannon H (log2)	3.93
Simpson D	0.09

VOLITINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	169	55.69
Univoltine	130	42.99
Semivoltine	4	1.32

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	7	20	6.60
Intolerant	0	0	0.00
Clinger	11	117	38.61

BIOASSESSMENT INDICES

B-IBI (Karr et al.)		
METRIC	VALUE	SCORE
Taxa richness	29	3
E richness	4	1
P richness	0	1
T richness	4	1
Long-lived	3	3
Sensitive richness	0	1
%tolerant	6.60	5
%predators	21.45	5
Clinger richness	11	3
%dominance (3)	40.26	5
TOTAL SCORE		28

56 %

MONTANA DEQ METRICS (Bukantus 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	29	3	3	3
EPT richness	8	2	0	0
Biotic Index	5.76	2	1	0
%Dominant taxon	17.49	3	3	3
%Collectors	63.70	2	2	2
%EPT	17.49	1	0	0
Shannon Diversity	3.93	3		
%Scrapers + Shredd	5.28	1	0	0
Predator taxa	3	1		
%Multivoltine	55.69	2		
%H of T	20		3	
TOTAL SCORES		20	12	8
PERCENT OF MAXIMUM		66.67	50.00	38.10
IMPAIRMENT CLASS		SLIGHT	MODERATE	MODERATE

Montana DEQ metric batteries

